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CABOT CORPORATION, CAB-O-SIL DIVISION

TUSCOLA, ILLINOIS

PROCESS WASTE DISPOSAL
at
TUSCOLA PLANT

April 24, 1969

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APPENDIX

Exhibit A	Permit No. 1966-EA-32, January 20, 1966 Illinois Sanitary Water Board
Exhibit B	Letter dated September 13, 1968 to Gary E. Frashier from W. M. Sargent, Jr. Registered Professional Engineer State of Texas, No. 20276
Exhibit C	Letter dated August 25, 1966, to F. Scott Carpenter, Jr. from W. M. Sargent, Jr. Registered Professional Engineer State of Texas, No. 20276
Exhibit D	Letter dated April 24, 1969 to Gary E. Frashier from W. M. Sargent, Jr. Registered Professional Engineer State of Texas, No. 20276

Cabot Corporation, CAB-O-SIL Division

Tuscola Plant

Tuscola, Illinois

I. Process Waste Disposal at Cabot Corporation

1. History

1.1 Cabot Corporation, CAB-O-SIL Division, is a chemical manufacturer located in Tuscola, Illinois, which produces CAB-O-SIL, a finely divided silicon dioxide. The plant began operations in 1958 and has continued production since that time.

1.2 A by-product of the production processes is hydrochloric acid (33% HCl, 20° Baumé) which previously was disposed of by sales to other manufacturers.

1.3 Sales of the hydrochloric acid were drastically curtailed in 1966, which presented a significant disposal problem to the Company.

1.4 As a solution, Cabot applied for and received a permit to drill a deep well disposal unit into which the acid has subsequently been injected.

1.5 Through current sales of hydrochloric acid, and use of the deep well for injection of unsold acid, the Company has been able to safely dispose of all by-product hydrochloric acid without pollution or contamination.

1.6 Incidental to production processes are the various process waste streams which contain chloride ion of various concentrations. These streams originate principally from pump seals, wash down locations and testing points.

1.7 Chlorides are also present in the process water which is purchased from an outside source, since the Company has no water wells of its own.

1.8 During construction of the plant in 1958, two earthen dike settling ponds were provided.

1.9 In 1962, the ponds were lined with limestone to provide for neutralization and control of pH.

1.10 In 1963, limestone bridges were added which effectively made four ponds out of two. The ponds were divided in this manner as a further control of pH and to provide retention for settleable solids.

1.11 In 1967, Cabot constructed four additional settling ponds which were bridged and lined similar to previous construction. These ponds were to provide additional capacity for removal of settleable solids and for the dilution of process streams.

1.12 During this period, the plant has had a continuous program of maintenance and improvement of the settling ponds.

1.13 At the completion of these additional corrective measures, the Company records indicated that the chloride content of the settling ponds effluent to be 8000 ppm.

1.14 Continuing steps were taken by Cabot Corporation in 1967 and 1968 to determine and isolate the sources of these chlorides.

1.15 By the end of 1968, the chlorides content of the plant effluent had been reduced from the 8000 ppm to approximately 2500 ppm.

1.16 This was accomplished by:

1.16.1 Recycling the stack washdown water and pumping intermittently to a containment pond.

1.16.2 Diversion of pilot plant effluent to a containment pond.

1.16.3 Reconstruction and modification of ponds and dikes to provide for increased settling and neutralization of waste materials.

1.16.4 Construction of new junction boxes to control the flow and dilution of all waste effluents, and installation of an entirely new underground vitrified clay tile gathering system.

2. Present Situation

2.1 Plant records indicate that from 1967 to the present date chlorides have been reduced from 8000 ppm to 2500 ppm at the west junction box, and 2100 ppm at the east junction box, which is at our property line.

2.2 Currently, all excess hydrochloric acid is disposed of by injection into the deep well, and Staley Starch Filtrate Wastes are passed through a Pall Trinity filter, which removes suspended solids, and are then also disposed of by injection into the deep well disposal unit.

2.3 Plant process wastes are collected in various lines. Those with settleable solids content are delivered to the settling ponds and

2.3 (Cont.)

contained for evaporation. Other chloride streams are also delivered to other ponds and then to the west junction box for dilution.

2.4 From the west junction box (upstream), the flow is to the east junction box (downstream). At the latter point, additional dilution is obtained from field drainage tiles which contribute flows from the southwest and northwest. These flows are from farmland drainage.

2.5 The east junction box is also the point at which the plant effluent enters the underground drainage system of Drainage District #4 of the Tuscola Township, Douglas County, Illinois.

2.6 Feeder lines are connected to the underground drainage system of Drainage District #4. The point of origin of these feeders is not known, nor is the character of the effluent they contribute.

2.7 The Drainage District #4 system eventually discharges into the water of the State at the Scattering Forks Estuary, and the average chloride level discharged to the waters of the State is 300-400 ppm.

2.8 Presently, hydrochloric acid is disposed of in the deep well at the rate of approximately 107,000 gallons per month, however, the pumping rate is a maximum of 75 gpm on an intermittent basis.

3. Proposed Solution

3.1 To locate the possible sources of pollution or contamination,

3.1 (Cont.)

Cabot Corporation has made a detailed study of the origin, character and intensity of all process effluent streams within the plant proper.

3.2 All low chloride streams, which do not contain acids or other deleterious materials, will be collected and combined for discharge into the plant effluent stream which flows directly into the drainage system of Drainage District #4 of the Tuscola Township, Douglas County, Illinois. This effluent stream will contain approximately 400 ppm chlorides.

3.3 All other process effluent streams will be collected and passed through a series of four (4) settling ponds and into a sump pit.

3.4 From the sump pit, the wastes are to be pumped through a series of mechanical filters and then injected into the existing deep well disposal unit.

3.5 Settleable solids will be removed in the settling ponds, with any carry-over solids being removed by the mechanical filters. These filters will remove particulate matter larger than 75 micron size.

3.6 The maximum proposed injection rate of 150 gpm is in accordance with the allowable at low pressure as indicated by the letter dated April 24, 1969 by W. M. Sargent, Jr., Registered Professional Engineer, State of Texas License No. 20276.

3.7 A dual mechanical filtering system to remove solids particulates larger than 75 micron size will forego the possibility of plugging

3.7 (Cont.)

the disposal formation in the deep well as is outlined in Mr. Sargent's letter.

3.8 Since the plant has eight (8) settling ponds, and only four (4) are to be used in tandem, four (4) ponds will always be on a "stand-by" or reserve basis affording a factor-of-safety to protect against unforeseen events. The stand-by ponds provide for collection of a minimum of seven (7) days storage of process effluents should any part of the disposal operation be shut down by reason of equipment or power failures.

3.9 Pumping and filtering equipment are to be installed in parallel to enable cleaning, backflushing, and repair and maintenance operations to be accomplished without interruption of the system.

3.10 Sludge from the filters, which is estimated will not exceed ten (10) pounds per day, is to be collected, air dried, and disposed of by burial on plant property.

3.11 Sludge from the settling ponds is normally removed once per year. This sludge is also to be air dried, and disposed of by burial on plant property. It is estimated that the volume of sludge from the settling ponds should not exceed 55,000 pounds of dry solids per year.

ASSUME 100 #/FT³
= 550 FT³

3.12 The proposed disposal method will reduce the volume of effluent released to the drainage district, will remove the unacceptable chlorides and acidic streams, and afford better handling and

3.12 (Cont.)

containment of the effluents as they will be routed for proper disposal by controlled collection.

3.13 Using current effluent flows, plus estimated flows to be generated by plant expansion, plus a factor-of-safety, the maximum effluent flow delivered for injection into the disposal well (including HCl disposal) will not exceed 150 gpm.

3.14 The injection operation will be intermittent, thereby increasing the factor-of-safety mentioned above.

CABOT CORPORATION, CAB-O-SIL DIVISION

TUSCOLA, ILLINOIS

APPLICATION FOR PERMIT TO DISPOSE OF CHLORIDE PROCESS EFFLUENT INTO EXISTENT DEEP WELL DISPOSAL UNIT

April 24, 1969

Cabot Corporation, CAB-O-SIL Division

Tuscola Plant

Tuscola, Illinois

II. APPLICATION FOR PERMIT TO DISPOSE OF CHLORIDE PROCESS EFFLUENT INTO EXISTENT DEEP WELL DISPOSAL UNIT

1. Type of Industry

1.1 Cabot Corporation has a Chemicals Plant located three (3) miles west of Tuscola, Illinois, which manufactures a finely divided silicon dioxide. The product is sold under the trade name of CAB-O-SIL. This very versatile material is used as a rubber reinforcing agent, an "anti-crawl" additive to plastics, an anti-settling agent in paints and flattener in varnish, as well as a thixotropic agent in printing inks. It adds non-sticking qualities to insecticides, insulating qualities to electrical equipment, and is a coating for paper.

1.2 The plant currently employs some 73 people and in all probability will continue to expand in the future.

1.3 The Corporation is also the world's largest carbon black manufacturer and is engaged in oil and gas development and production in the Southwest.

1.4 A by-product of the process at the Tuscola Plant is hydrochloric acid, part of which is disposed of through sales to other companies. The unsold portion of the hydrochloric acid by-product is disposed of by injection into a deep well which Cabot Corporation drilled and completed on the plant property. Application was

1.4 (Cont.)

made by the Company for this well and approved by the Illinois Sanitary Water Board on January 20, 1966, Permit No. 1966-EA-32. A Xerox copy of this permit is attached as Exhibit A.

2. Location

2.1 The location of the approved disposal well (referred to in Item 1.4 above) is 1745 feet north and 2120 feet west of the southeast corner of Section 31, Township 16 North, Range 8 East of the Prime Meridian, Douglas County, Illinois. The location is in the SE/4 of Section 31 on land owned in fee by Cabot Corporation.

3. Volumes

3.1 Current disposal rates by injection into the deep well are:

1.40/100 in Tank car 1964 price

3.1.1 400 tons or 107,000 gallons of 33% HCl 20° Baumè per month.

3.1.2 3570 gallons per day

3.1.3 2.5 gpm (average)

3.2 Item 3.1.3 is based on a full day's pumping. However, pumping is intermittent at the rate of 75 gpm.

3.3 Cabot proposes to add to this injection disposal at the rate of 60 gpm of process effluent on an intermittent basis. This process effluent must be disposed of to reduce chloride content and maintain other streams acceptable as effluent from the plant.

4. Characteristics of Waste

4.1 The current waste disposal consists of 33% hydrochloric acid with a gravity of 20 Baumé.

4.2 Cabot proposes to add to this disposal, waste liquids with a chloride ion content. It is estimated that the chloride content will be approximately 3000 ppm, with a pH of 1.0. Total non-chloride solids plus dissolved chlorides will be approximately 3780 ppm. T.D.S.

4.3 Disposal of the chloride wastes by deep well injection will enable Cabot to maintain the plant effluent at approximately 400 ppm chlorides as discharged to Drainage District #4 of the Tuscola Township, Douglas County, Illinois.

4.4 Chlorides wastes delivered to the injection point will not exceed 75 micron particulate size after passing through mechanical filters.

5. Deep Well Disposal Unit

5.1 The disposal well unit is 5317 feet in depth.

5.2 Description of well, materials of construction, drilling logs and test information have been previously submitted with original application. Permit No. 1966-EA-32 dated June 20, 1966, Illinois Sanitary Water Board.

5.3 Chlorides in disposal strata at 5300 foot depth are 20,000 ppm.

5.4 Information from letter from W. M. Sargent, Jr., Registered Professional Engineer, State of Texas No. 20276, to Gary E. Frashier dated September 13, 1968.

5.4.1 Pumping rate into the well at 500 gpm is completely feasible and practical.

5.4.2 Fracture pressure of the formation is estimated at 2500 psig at the well head.

5.4.3 Tests run in 1966 indicated that, with present facilities, injection rates up to 280 gpm increased bottom hole pressure only 11 psig with little or no surface pressure.

5.4.4 Injection pressure at 500 gpm through larger tubing would be less than 100 psig and very possibly 0 psig at well head.

5.4.5 Estimated rise in bottom hole pressure while injecting at 500 gpm would not exceed 50 psig, which is well below the fracture pressure of the formation.

5.4.6 Injection is into a Dolomitic cavernous formation. There should be no problem with gas entrainment increasing injection pressures, nor should there be problems concerning reductions in permeability or porosity due to minute amounts of suspended solids in the injected wastes. Reaction of acid upon the Dolomite formation into which injection is being made should result in enlargement of the flow channels with no resulting plugging materials being liberated. The reaction of hydrochloric acid in Dolomite results in calcium chloride and magnesium chloride, both of which are soluble and will stay in solution, plus water and carbon dioxide. The bottom hole pressures are

such that carbon dioxide formed in the chemical reaction remains in solution with water.

5.5 Refer also to letter W. M. Sargent, Jr., Registered Professional Engineer, State of Texas No. 20276, to F. Scott Carpenter, Jr. dated August 25, 1966.

5.5.1 After injectivity test run at 280 gpm for 8.5 hours, the bottom hole pressure increased 11 psig.

5.5.2 Upon shut-in, prestatic conditions were achieved in less than 6 minutes.

5.5.3 Measured bottom hole pressure at 4861 feet (approximate tubing depth) was 2035 psig.

5.5.4 Test indicated that the ultimate capacity of the well at 0 psig surface pressure to be approximately 1500 gpm.

5.5.5 Rapid return of bottom hole pressure to normal at the end of the injection period indicates excellent permeability within the area affected by the injection test.

5.6 Well Construction

5.6.1 As previously approved by the Illinois Sanitary Water Board, January 20, 1966, Permit No. 1966-EA-32.

5.7 Well Operation

5.7.1 As previously approved by the Illinois Sanitary Water Board, January 20, 1966, Permit No. 1966-EA-32.

6. Pump Pressure

6.1 Pressures that will be required to dispose of the chlorides wastes material are not known at this time, however, it is believed it will not exceed 50 psig at the well head.

6.2 Currently the hydrochloric acid disposal is being accomplished using a transfer pump at no well head pressure.

6.3 In the event that pressure is required, it will be held as low as possible. In no event would it exceed the parting pressure of the formation (roughly equivalent to 1/2 psi per foot of depth).

6.4 The general flow of all hydrochloric acids and chlorides wastes are as follows:

6.4.1 Collected in various plant piping systems and delivered to a series of settling ponds to remove settleable solids.

6.4.2 Flow by gravity from settling ponds to a sump area.

6.4.3 Pumped from the sump area, through mechanical filters, to the deep well injection point.

7. Wells in Vicinity

7.1 There are several fresh water wells in the vicinity (less than one mile) of the deep well location. These wells are all relatively shallow (less than 200 feet). Cabot has set surface casing to a depth of 815 feet to protect these wells from contamination.

7.2 The nearest oil wells are approximately two miles southwest of the deep well. These wells produce from the Spar Mountain Sandstone at a depth of 1600 feet and will not be subject to contamination by the addition of chlorides injection.

7.3 To the best of our knowledge, there are no deep wells, or brine wells in the immediate vicinity of the plant.

8. Logs of Other Wells in the Area

8.1 See Permit No. 1966-EA-32, dated January 20, 1966, Illinois Sanitary Water Board.

9. Design Plans of Well

9.1 Plans of the deep well are on file with the Illinois Sanitary Water Board, Permit No. 1966-EA-32, dated January 20, 1966.

10. Drill Cuttings and Water Analysis

10.1 These were previously submitted to Illinois State Geological Survey. See Permit No. 1966-EA-32, dated January 20, 1966, Illinois Sanitary Water Board.